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ABSTRACT

Low and Wolfe (1981), in a study on the enduring effects of first grade teachers, found unexpected results that short-term gains in first grade do not necessarily lead to long-term academic gains. These results differed from Pedersen, Faucher and Eaton's (1978) findings. To investigate this anomaly, the primary and multilevel editions of the SRA Achievement Series were administered to a total of 417 students twice a year from first through fifth grade. The results of the analysis, based on the mean levels of achievement in math and reading, showed that students of the identified effective first grade teacher achieved gains in both math and reading and did so repeatedly. However, the students who achieved test score gains over their first grade peers did not achieve gains in subsequent elementary school grades as fast as students of the other teachers. By fifth grade, the initial gain group of students was over a half of a standard deviation below the mean of other students. It was concluded that early elementary education may be more beneficial if it teaches students how to learn, rather than basic skills. (PN)

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ENDURING EFFECTS OF FIRST-GRADE ACHIEVEMENT

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ENDURING EFFECTS OF FIRST-GRADE ACHIEVEMENT

ABSTRACT

In 1981, Low and Wolfle (1981) studied the enduring effects of an effective first-grade teacher. They found that short-term gains in first grade do not necessarily lead to long-term gains in subsequent elementary grades. These unexpected results led the authors to attempt several tests in an effort to explain their anomalous findings. This paper continues the search for a plausible explanation for why short-term gains do not translate into long-term gains.

ENDURING EFFECTS OF FIRST-GRADE ACHIEVEMENT

Most studies of teacher effectiveness have examined the short-term effects of teachers on the academic achievement of their students. Few studies have focused on whether teachers have enduring effects (see Harnqvist, 1977). One study (Pedersen, Faucher and Eaton, 1978), which did focus on long-term effects, uncovered one first-grade teacher whose students had significantly greater IQ increases in elementary school than did students of other teachers, and also achieved occupational stations in later life far above those students of other first-grade teachers.

In 1981, Low and Wolfle (1981) attempted to test the robustness of Pedersen, Faucher and Eaton's (1978) conclusions about the enduring effects of first-grade teachers. Unlike Pedersen, et al. (1978), who had pre-identified their effective teacher, Low and Wolfle (1981) used a regression approach to predict end-of-first-grade SRA test scores, and identified an effective first-grade teacher on the basis of large, positive residual mean gains in achievement. Having identified one teacher whose first-grade students exhibited gains in academic achievement far above pupils of other teachers, their study focused on the question of whether those students continued to demonstrate superior levels of achievement in subsequent grades. Surprisingly, Low and Wolfle's (1981) results indicated that the students of the effective first-grade teacher not only failed to continue their superior performance in subsequent elementary grades, they did relatively worse than the students of the other eight teachers in the study.

These unexpected results led Low and Wolfle (1981) to attempt several tests in an effort to explain their anomalous findings. They were apparently able to eliminate several possibilities. Socioeconomic differences (as best as could be measured) did not contribute to the explanation of teacher differences in achievement. Moreover, the students of the effective first-grade teacher apparently were not disproportionately assigned to poorer teachers in subsequent grades.

One possibility considered in the earlier study was that the teaching style of the effective first-grade teacher produced both rapid gains in first grade, and also the relatively lower scores in subsequent grades. This conclusion, however, bears the same weakness included in all so-called residual explanations. That is, just because several plausible alternatives have been eliminated, there is no way to be sure that yet another alternative, which has not been eliminated for lack of data, is the functional explanation. The purpose of the present paper is to continue our search for a plausible explanation for our unexpected and surprising results. Two modest steps have been taken. First, the Low and Wolfle (1981) results were based on the combined SRA reading and mathematics tests. It is possible that the aggregation of these tests has masked some important counteracting forces that would be revealed by analyzing the SRA reading and mathematics tests separately. Second, the first-grade cohort of 1974-75, on which the Low and Wolfle (1981) paper was based, may have been an anomalous cohort of students for unknown reasons. It is possible that the first-grade class of 1974-75 produced results that cannot be replicated in another cohort of students

for the same teachers. These, then, are the items on this paper's agenda: Are the results discussed by Low and Wolfle (1981) replicable with disaggregated subtests; and are the results replicable with another cohort of students for the same teachers?

THE DATA

The sample of teachers for this study was composed of nine female first-grade teachers who had taught first grade from the fall of 1974 through the spring of 1980 in a rural county in Virginia. Two cohorts of students were included in this study. The first cohort started first grade in the fall of 1974 (the same students included in the original paper); the second cohort started first grade in the fall of 1975. There were 195 students in the 1974 cohort, and 222 students in the 1975 cohort.

The testing instruments used in this study were the primary and multilevel editions of the SRA Achievement Series. These tests were administered to the students in the fall and spring of each school year through grade five. Raw scores were converted to growth scale values in order to make grade-to-grade comparisons. In the previous study, composite scores were used in the analyses; the present study examines reading and math scores separately.

IDENTIFYING AN EFFECTIVE FIRST-GRADE TEACHER

To determine whether students of an effective first-grade teacher demonstrated superior achievements in subsequent elementary grades, it was first necessary to identify an effective teacher. In Low and Wolfle (1981) this was accomplished by regressing end-of-first-grade SRA

scores on the students' scores recorded at the beginning of the year, and then measuring the residuals. One teacher, identified as teacher #8, was recognized as the effective teacher; her students had residualized mean scores far above those of any other teacher. In the present study, the same procedure was used again, only this time we have two cohorts of students, and SRA achievement scores in both reading and math areas.

The results reported in Tables 1 through 4 indicate that the students of teacher #8 had larger residualized mean gains in both math and reading in both 1974-75 and 1975-76 than did the students of the other eight first-grade teachers in the study. The residualized mean gains of teacher #8's students were not always significantly different from those of all other teachers, but the overall pattern seems clear. We conclude that teacher #8 is indeed an effective teacher. Her students began first grade with SRA achievement scores indistinguishable from students of other first-grade teachers, but by the end of first grade her students demonstrated gains far above those students of most other first-grade teachers. This is true for at least two cohorts of first-grade students, and is demonstrable for both math and reading.

It appears therefore that the effectiveness of teacher #8 was not restricted to a unique cohort of students, and was not restricted to one subject matter. Teacher #8 did indeed produce both math and reading gains in her first-grade students. These gains could not be attributed to the students' IQ, and were larger than gains of students of other teachers.

ENDURING EFFECTS OF FIRST-GRADE ACHIEVEMENT

The identification of teacher #8 as an effective first-grade teacher in this study led us to the next step. Did exposure to teacher #8 in the first grade produce enduring effects, which could be measured in terms of superior achievement in subsequent elementary grades? When Low and Wolfle (1981) asked this question in their previous analysis, they expected the answer would be positive. That was not what they found, however. They found that the students of teacher #8 performed in subsequent elementary grades at a level below that of students of the other teachers. The present study disaggregates the SRA test score into its math and reading components in order to measure the enduring effects of teacher #8 by subject matter. By now we have come to expect that the students of teacher #8 will not do as well as students of other teachers in either math or reading.

To effect this analysis the mean level of achievements in math and reading for the students of teacher #8 were compared to the mean level of achievement of the students of all other teachers. The latter mean was assumed to be a population parameter, against which the mean of teacher #8's students was compared. In practice, there are four means compared for each academic area, one each for grades two, three, four, and five. Because of the multivariate comparison, a Hotelling's T-square statistic was used to determine if the vector of means for teacher #8 were different from the vector of population means computed from all the other students.

In 1974, the teacher #8 sample group was composed of 14 students, while the population mean was based on the scores of 120 students. The students in both groups represented those for whom spring achievement test scores were available for each of the four years of schooling subsequent to first grade. In 1975, there were 15 students in the teacher #8 sample group, and 134 students in the population group. Once again, these represent students for whom complete data were available.

Tables 5 and 6 report the results in reading and math for the 1974-75 cohort of first-grade students. These results mirror the results of Low and Wolfle (1981). The students of teacher #8, who were ahead of their peers at the end of first grade, do not achieve gains in subsequent elementary school grades as fast as do students of other teachers. By fifth grade, the students of teacher #8 were over half of a standard deviation below the mean of the other students.

Tables 7 and 8 report the results in reading and math for the 1975-76 cohort of first-grade students. If these results match those of the 1974-75 cohort, we can be assured that the effects observed earlier were not unique to a single cohort of teacher #8's students. In reading (Table 7) the Hotelling's T-square statistic of 6.19 indicates that there is no significant difference in the two mean vectors. That is, the students of teacher #8 performed at levels indistinguishable from those of students of all other teachers. In math, the students of teacher #8 had fallen behind their peers in other classes by third grade, but by fifth grade were about one-half standard deviation ahead of their peers. The two

vectors are significantly different, but the individual means are not monotonically related. In general, then, we conclude that the students of teacher #8 did not outperform their peers in other first-grade classes in subsequent elementary grades.

In the end, we conclude that teacher #8 was an effective first-grade teacher. Her students gained more in both math and reading achievement than did students of the other teachers in the study, and did so not just once, but repeatedly. Yet the gains made in first grade did not lead to further gains in subsequent grades. The gains were not even sustained. The students of teacher #8 in general fell behind their peers from other first-grade classes, and fell further behind with each subsequent grade.

DISCUSSION

We began this investigation with the intention of replicating the earlier Low and Wolfle (1981) study. We essentially followed the same procedures that we followed in the previous study, but we used two cohorts of students instead of one. We also disaggregated the SRA achievement score into its math and reading components, and measured both short-term and long-term gains separately by subject. We identified an effective first-grade teacher on the basis of short-term gains in achievement exhibited by her students at the end of first grade. The present analysis confirmed our earlier conclusion; teacher #8's students outscored the students of the other eight teachers at the end of first grade. When we focused on long-term gains, however, teacher #8's students exhibited the same pattern as in the earlier

study--they did relatively worse than students of the other first-grade teachers in subsequent elemetary grades.

Unfortunately we still do not know why the students of teacher #8, who got off to such a good start in first grade, were unable to sustain their advantage. We have considered, and dismissed, a number of explanations. We do not think teacher #8 cheated in the administration of her examinations. We do not think differences in socioeconomic status explain the results. We do not think the students of teacher #8 were systematically assigned to incompetent teachers in their later elementary grades. In truth, we are puzzled by our results, and would love to have someone replicate our analyses on another set of teachers. We think much could be learned from such replications.

Finally, and for whatever it's worth, we would like to present our current view of why teacher #8's students performed so well in first grade, but fell behind their peers in subsequent grades. Our view is controversial, and open to debate; it is offered for purposes of discussion. We believe that teacher #8 was found to be such an effective first-grade teacher because she emphasized a style of teaching that is popularly characterized as "back to basics." She was not the only teacher among the nine in our study who emphasized basic skills in their approach to teaching first grade, but teacher #8 was clearly the most effective at doing so. Drilled in arithmetic and reading skills, teacher #8's students at the end of first grade were far ahead of their peers in possession of those skills (incidentally measured by SRA). But it may be that the early elementary grades are more beneficially spent teaching

students how to learn, rather than teaching basic skills. If this is what has happened, then teacher #8's students performed well at the end of first grade because they had been drilled in basic skills, but were not able to sustain their lead in measured achievement because they missed receiving some developmental skills learned by their peers.

We have not been deliberately vague in our discussion of the presentation of material in teacher #8's class. Rather, we have had to guess about teaching effects, because we know only a little about how teacher #8 conducted her class. We would like to end, therefore, with a plea. We think we have stumbled on something important. Short-term academic gains, particularly in the early elementary grades, do not automatically translate into long-term gains. In fact, just the opposite may be true. We need to find out why, and we would like to urge others to replicate our analyses. But more importantly, we need to support ethnographic studies of teachers in their classrooms, followed by long-term follow-ups of students to measure the enduring effects of varying teaching styles. Only by such studies will the puzzling question raised by our analyses be answered--why are students, who make large gains in first-grade achievement, unable to sustain their advantage?

Table 1. Oneway Analysis of Variance With Teacher Means and Standard Deviations for First-Grade Reading 1974-75

Teacher	Number of Students	Mean Residualized Gain	Standard Deviation
1	23	-13.03	38.70
2	23	20.14	35.81
3	24	4.62	32.40
4	18	7.14	39.28
5	25	-16.80	39.28
6	21	11.31	33.22
7	28	-35.43	43.90
8	19	34.97	36.77
9	14	7.67	34.73

F-Ratio	Probability
7.401	< 0.0001

Table 2. Oneway Analysis of Variance With Teacher Means and Standard Deviations for First-Grade Math 1974-75

Teacher	Number of Students	Mean Residualized Gain	Standard Deviation
1	23	-19.17	21.82
2	23	- 8.86	21.66
3	24	- 2.18	16.86
4	18	17.19	36.40
5	25	-18.37	15.46
6	21	2.11	21.69
7	28	3.73	22.78
8	19	38.40	33.85
9	14	- 2.26	18.48

F-Ratio	Probability
11.77	<0.0001

Table 3. Oneway Analysis of Variance With Teacher Means and Standard Deviations for First-Grade Reading 1975-76

Teacher	Number of Students	Mean Residualized Gain	Standard Deviation
1	32	7.70	4.40
2	34	4.95	43.78
3	25	- 0.52	37.86
4	17	- 2.24	47.86
5	31	- 3.96	41.58
6	22	-22.78	48.09
7	27	-18.40	44.71
8	22	22.40	46.65
9	12	22.00	36.28

F-Ratio	Probability
2.658	0.0085

Table 4. Oneway Analysis of Variance With Teacher Means and Standard Deviations for First-Grade Math 1975-76

Teacher	Number of Students	Mean Residualized Gain	Standard Deviation
1	32	5.87	34.01
2	34	- 4.62	25.15
3	25	-24.18	18.99
4	17	- 1.14	21.23
5	31	1.28	24.50
6	22	-15.82	19.85
7	27	- 4.64	31.86
8	22	33.24	33.92
9	12	24.64	32.35

F-Ratio	Probability
8.560	< 0.0001

Table 5. Mean Reading Achievement Scores for Teacher #8 and Other Teachers, 1974-75 First-Grade Students

Grade	Teacher #8	Other Teachers
2	234.46	213.17
3	219.85	245.31
4	238.92	268.09
5	260.92	294.41

Hotelling's $T^2 = 51.08$

Table 6. Mean Math Achievement Scores for Teacher #8 and Other Teachers, 1974-75 First-Grade Students

Grade	Teacher #8	Other Teachers
2	204.23	184.82
3	245.00	236.58
4	236.46	267.01
5	276.00	299.11

Hotelling's $T^2 = 56.99$

Table 7. Mean Reading Achievement Scores for Teacher #8 and Other Teachers, 1975-76 First-Grade Students

Grade	Teacher #8	Other Teachers
2	220.00	219.70
3	249.23	269.89
4	262.54	273.18
5	308.38	313.79

Hotelling's T^2 = 6.19

Table 8. Mean Math Achievement Scores for Teacher #8 and Other Teachers, 1975-76 First-Grade Students

Grade	Teacher #8	Other Teachers
2	209.00	195.24
3	241.69	260.55
4	275.23	273.96
5	343.00	317.58

Hotelling's $T^2 = 59.24$

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